Appendix

F

AUTOMATED WEATHER FACILITIES

Introduction

This appendix provides background information on the two primary types of automated weather facilities in use at airports across the United States and internationally. The two units are named automated weather observing system (AWOS) and the automated surface observing system (ASOS). The characteristics of the facilities are described below. Each has a role in the real-time acquisition and dissemination of aviation weather and in the development of responsive weather data networks.

AWOS Background

Automated weather observing systems (AWOS) were first introduced in the mid-1950's when the Federal Aviation Administration (FAA) established an automated meteorological observation station at Front Royal, Virginia. The system reported weather parameters at the unattended, low frequency range location via a teletypewriter network on a 24-hour basis.

The present AWOS and automated surface observing systems (ASOS) are an outgrowth of the advances made in the computer and weather sensor technologies. The new technologies that are employed in the current AWOS and ASOS are based on the use of digitized data, computer processing, voice synthesizing, and customized software programs, all operating at speeds that approach real-time.

The National Weather Service (NWS) has established standards for the implementation of ASOS for itself, the FAA and the military. The FAA, in turn, in anticipation of a proliferation of the AWOS, has prepared a set of standards and specifications for non-federal AWOS facilities. Compliance with these standards will permit vendors to obtain certification for their systems and consideration for incorporation of their units in the national weather network. As of this date, several manufacturers have received FAA certification for four levels of AWOS facilities -- AWOS-A, AWOS-1, AWOS-2 and AWOS-3.

An AWOS is a hands-off set of equipment that collects desired weather parameters from the environment by using a variety of sensors; formats this weather data, processes it into digital and voice signals, and disseminates this data to telephones, computer terminals, storage devices and radio transmitters. This data can then be intercepted by pilots in the air from a navigational aid or a dedicated frequency channel; by users on the ground by telephone, personal computer, or by monitoring an appropriate navigational aid or dedicated frequency channel. The AWOS is an unbiased weather observing system that performs without human intervention unless a manually augmented report is desired, generating a complete weather report each minute of every hour for 24 hours a day. Each AWOS has a group of sensor devices, a data collection module, a formatting processor and gateway module(s). The number of sensors that are associated with the AWOS is dependent upon the type, the purpose for which it is to be used, and the sophistication desired.

Sensory Devices

Presently, there are four types of AWOS. They differ by their degree of sophistication (type of sensors). AWOS-A is the least sophisticated and the AWOS-3 is the most sensor laden system. Categorizing the types of AWOS with the appropriate sensors creates the index presented earlier in Table 2-6. Additional sensors may be added to each AWOS-type dependent on certification by the FAA.

Data Collection Module

This unit receives the data from the sensors and along with the processor formats and controls the information and prepares it for dissemination.

Formatting Processor

In printed form, the AWOS report resembles the present NWS report. The same information can be disseminated by a near-human voice synthesizer. This synthesized voice broadcast is especially practical for transmission to pilots because the voice quality from each AWOS remains constant. The details of the AWOS report are also summarized in the earlier Table 2-5.

Gateway Module (Dissemination Group)

The weather information (report) with the help of the gateway module(s) can be accessed by a variety of communications types and users. The information can be dispatched to a user via a telephone, data terminal, digital printer and ground-to-air transmitter. The mediums that are available are telephone, UHF/VHF

radio, microwave link and other communications transmission means including geostationary satellite telemetry.

The user has several reception options:

1. Random interrogation. The user requests the information whenever desired.

2. Pre-selected time intervals. The user receives the data those times that previous arrangements have been made; equipment has been provided for by the user; the reception is automatic.

3. Random dependent intervals. The user receives the information when certain parameters have been reached. The user will receive the data automatically.

4. Alert signals can be programmed into each of the reception intervals.

Output Modes

The output mode of the AWOS report is controlled by one of four modes of operation. Mode 1 is the full-time automated response without a weather observer input to the observation report, unless an agreement with the NWS is in effect to maintain a manual backup capability. Mode 2 is a full-time automated operation with provision for local input of notice to airmen (NOTAM). The NOTAM is appended verbally to the AWOS broadcast and addresses items related to the operation of the airport. The NOTAM is not transmitted digitally to the weather data collection network. A third mode of operation provides for a full-time automate response with manual augmentation of the weather report and an option to include NOTAM information. Both verbal augmentation and manual entry into the weather data network is permitted. Mode 4 is termed part-time manual and is normally used for backup. The intent is to allow a weather observer to enter a complete manual observation which modifies the AWOS report to certain other NWS standards. The manual entry is broadcast as well as distributed over the weather data network.

Operationally, Mode 1 is the standard and the manual augmentation must be made by a NWS-certified observer. Modes 2, 3 and 4 require that the AWOS be equipped with an operator terminal with which the inputs can be made. Modes 3 and 4 also require that the location be designated as a supplemental aviation weather reporting station (SAWRS) by the NWS and that the observer be NWS-certified.

For the purposes of this plan, the AWOS requirements should have the capability to meet Mode 2 standards unless the airport in question opts to certify observers in which case Modes 1, 3 and 4 are applicable.

ASOS Background

ASOS represents the NWS response to automating the collection of certain weather data. The ASOS includes all those sensors that comprise the AWOS-3 and, to meet additional data requirements specific to the NWS, other sensors complement the ASOS unit. These include a precipitation identification sensor that is capable of distinguishing between light, moderate and heavy rains or snow; or mixed precipitation. This sensor data is also referred to as the present weather sensor. A second additional sensor to the ASOS is the freezing rain sensor. Some sensors on the ASOS are designed to more stringent performance specifications than those required in the AWSO family. Consequently, the cost of the ASOS is nearly three times that of the AWOS-3.